Southern Area Fire Risk Assessment

Winter/Spring 2017

Southern Area Coordination Center
Rapid Assessment Team

An interactive online version of this assessment is available *here*
An additional situational awareness viewer which allows managers to view dynamic weather and fire danger conditions is available *here*

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Executive Summary

In response to elevated risk across portions of the Southern Area, a fire risk assessment was conducted to assess the potential and expected fire situation for the late winter and spring fire season. The assessment period extends from February 1 to May 1, 2017 and covers four general geographic areas: Florida, the piedmonts of the Carolinas and Georgia, the southern Appalachian Mountains, and central Texas and Oklahoma. The analysis includes the current weather situation and extended forecast, fuels compared to normal for the time of year, the National Fire Danger Rating System's energy release component for each Southern Area Predictive Service Area, and fire occurrence. Recommendations are provided based on the findings and conclusions of the assessment. Areas not analyzed within this seasonal assessment, at this time, are expected to observe a normal spring fire season. Fire weather over the next few weeks could substantially alter these current conditions. The Francis Marion National Forest recently experienced a 200 acre fire in the coastal plain of South Carolina. Those areas surrounding the southern Appalachian Mountains and not highlighted in the assessment should remain cognizant of the drought conditions and any void in frequent rain events. The 2016 fall fire season was unprecedented and those drought conditions, although improved, are amplified with lack of normal rainfall.

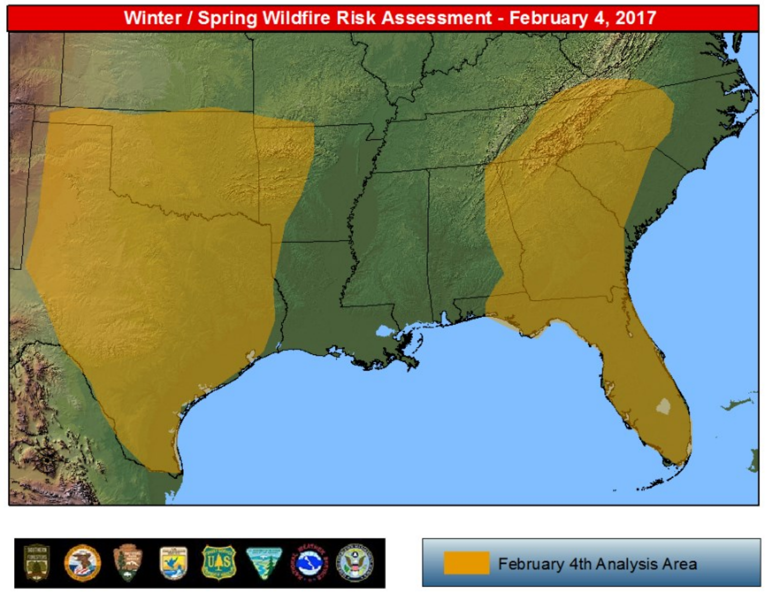


Figure 1. Map of the analysis area

Portions of the region in this analysis are approaching the beginning of their normal fire season. 2016 saw extended drought conditions in the southern Appalachian Mountains which supported a historic fall fire season. Precipitation deficits across central and southern Florida are currently concerning. Curing of vigorous herbaceous growth from growing season has resulted in an above normal fine fuel loading across Oklahoma and Texas. Oklahoma implemented a fuels and fire behavior advisory on February 1st. This dry pattern has led to a slight increase in wildfire activity and severity. In response to the dry conditions and its impact on the fire risk potential within the Southern Area, a fire risk analysis was conducted to:

- Evaluate the possible impacts (i.e., 1000 hour and duff/organic matter outlooks) of long-term drought heading into the spring fire season
- Identify the critical locations in the Southern Area
- Assess the key fire environmental indicators and thresholds which demonstrate above normal fire potential
- Gauge how severe the spring season may be
- Assist state and federal wildfire agencies with severity requests for emergency fire funding
- Inform FEMA of the southern fire potential to aid obtaining financial assistance

Based on current fuel conditions and forecasted weather conditions, the most likely scenario is an above average level of wildfire activity for February to May. This level of activity will likely cause some slight increase in firefighting resources being mobilized within a state. There is also a high probability the Southern Area will see higher than normal mobilization across state boundaries for this time of the year. It is also difficult to truly predict the overall wildfire risk as climate transitions from La Niña to neutral. Neutral conditions make long-range forecasting more difficult and less reliable.

Analysis Findings and Recommendations

Analysis Findings

The analysis findings indicate the following probabilities for the fall fire season for the assessment area:

Scenario Description for the 2017 Spring Fire Season (February through May)	**Southern Area Probability**
Most Likely Case The spring fire season in Florida, Texas, and Oklahoma is significantly active. High fine dead fuel loading is already supporting large fire growth in Oklahoma. The season is longer than normal due to the current drought, fuels conditions, and predicted weather pattern. Some additional aviation and ground resources are required due to fire behavior. Mobilization of resources to these critical areas, from across the Southern Area, occurs. Several Type III incidents occur at the same time in the Southern Area. There would be a higher probability of some of these Type III incidents transitioning to either Type II or I. However, no large scale mobilization of out-of-region resources are required due to at least some mitigating weather pattern (i.e., high humidity or periodic rainfall).	70
Best Case Transition from La Niña to neutral conditions promote normal rainfall pattern development. This brings frequent rainfall events and enough moisture to mitigate rainfall deficits across the assessment area. Rainfall activity occurs at a high enough frequency that fuel dryness is minimized with a resulting lower than average wildfire occurrence.	20
Worst case Rainfall frequency and amounts are little and strong; dry cold fronts bring significant fire weather. Moderate to severe drought conditions and extreme fire weather events result in numerous large fire incidents and heavy initial attack workload. Lack of rainfall, coupled with this long-term drought and minimal green-up, leads to an extended spring fire season. These areas experience a well above-average spring fire season, including numerous extended attack (Type I and II) fires. Large scale mobilization of out-of-region resources occurs.	10

Table 1. Analysis findings for the Southern Area 2017 spring fire season with probability rating

Recommendations

- This spring assessment has been completed prior to the typical fire season. As we move closer to and enter the spring fire season, managers should maintain situational awareness of current and trending conditions. Forecasting during a seasonal transition from La Niña to neutral conditions is difficult.

- The 2016 fall fire season was unprecedented and those drought conditions, although improved, are amplified with lack of normal rainfall. Fire personnel must remain cognizant of these conditions and monitor any voids in normal rainfall frequency.

- Fire managers will need to monitor fuels conditions in these assessment areas. This will become more important as the fire season and prescribed fire season start to blend together.

- Wildfire operations could evolve from normal operations to larger scale and more complex as the spring continues. Do not expect any fire to be routine. Be prepared to utilize indirect tactics with extended mop-up. Utilize aerial supervision to help direct crews and keep them informed on fire behavior. Ensure that LCES is in place before engaging on any fire. Remember to STOP, THINK, and TALK before you ACT and actively look for ways to minimize risk to firefighters in what is forecast to be a period of very high fire danger.

- Ensure out-of-region resources are briefed on current and past (2016) conditions. Utilize pocket cards showing the current situation and the WFAS mobile severe fire weather mapping program to stay current on conditions (http://m.wfas.net/).

- Monitoring of personnel stress and rest will be important as the spring progresses. The 2016 fall fire season was historic in the Southern Area, and resources have observed minimal rest prior to the spring 2017 wildfire season.

- Implementation of prescribed fire operations will need to be monitored as well. Fuel conditions will dictate fire behavior and smoke management procedures. The Ocala and Osceola National Forests in Florida have already suspended prescribed fire operations due to adverse fuels conditions.

    - Fire managers will need to continue to monitor prescribed fire parameters. Mindful selection of burn units will be important if drought conditions worsen. Engage in a risk dialogue with field personnel and leadership on ceasing or continuing prescribed fire operations. Daily discussion on resources needs for prescribed fire and suppression operations will be important.

- Fire managers should be prepared to support periods of more frequent fire occurrence and the potential for more complex, longer duration wildfire incidents.

- Maintain capabilities to mobilize Type III teams.

- Augmentation of initial attack resources will likely be required throughout the late winter and spring. This will result from increased fire behavior, fire spread, and longer mop-up times due to drought-stressed fuels and soil. Additional resources, both ground and aviation, may be needed.

- Ensure firefighter pocket cards are up to date and posted on the national website (http://fam.nwcg.gov/fam-web/pocketcards/).

Introduction and Background

The Southern Area is two months past the most devastating fall wildfire season in recent memory in terms of both lives and structures lost. The fall fire season of 2016 was brought on by both long-term drought and critical daily fire weather patterns. The area of greatest intensity of fire activity was the Appalachian Mountains of southwestern Virginia and eastern Kentucky south to northern Georgia. This area has generally seen a return to normal rainfall patterns since early December. Long-term drought still remains.

The historical fire activity for the Southern Area begins to rapidly increase in February and peaks in March. This activity occurs without the appearance of drought conditions. Long-term drought, coupled with normal increase in wildfire activity, can create a dangerous scenario. Fire managers should monitor closely the indicators listed in the remainder of the assessment.

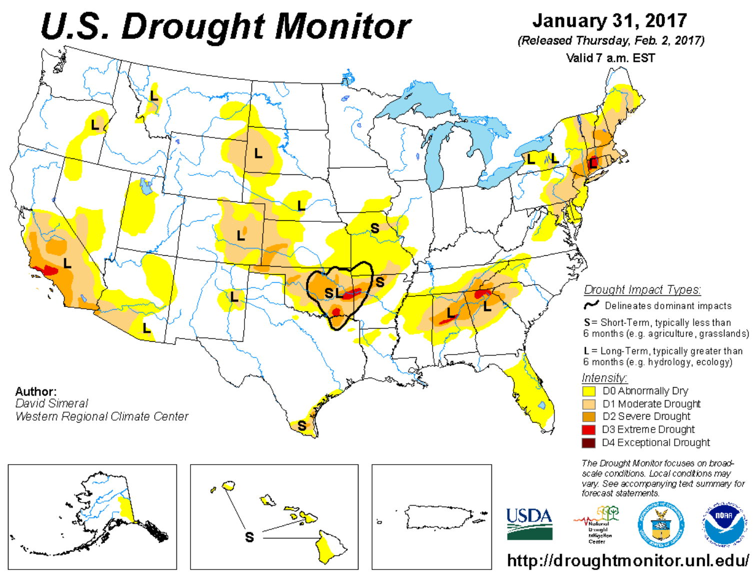


Figure 2. The National Drought Monitor displays the size and severity of drought conditions across the United States. Source: National Drought Monitor website

Figure 3. Map of current Southern Area large fires. There are currently nine fires greater than 100 acres. North Carolina Forest Service is currently managing a 500 acre fire at the IMT3 complexity level with 95% containment

Risk Analysis

Weather

A more normal weather pattern has developed across much of the region, particularly in areas most impacted by the extreme drought which developed in the summer of 2016. The normal pattern has allowed frequent rainfall events across the southern Appalachian Mountains to the lower gulf coast. The map below demonstrates the 60 day percent of normal precipitation. The northern portion of the southern Appalachians is well above normal at 125-150 percent. A significant portion of the Carolinas and northern areas of Georgia, Alabama, and Mississippi are 50 to 75 percent of normal. There is drought development in a large portion of Florida and parts of Texas, Oklahoma, and Arkansas.

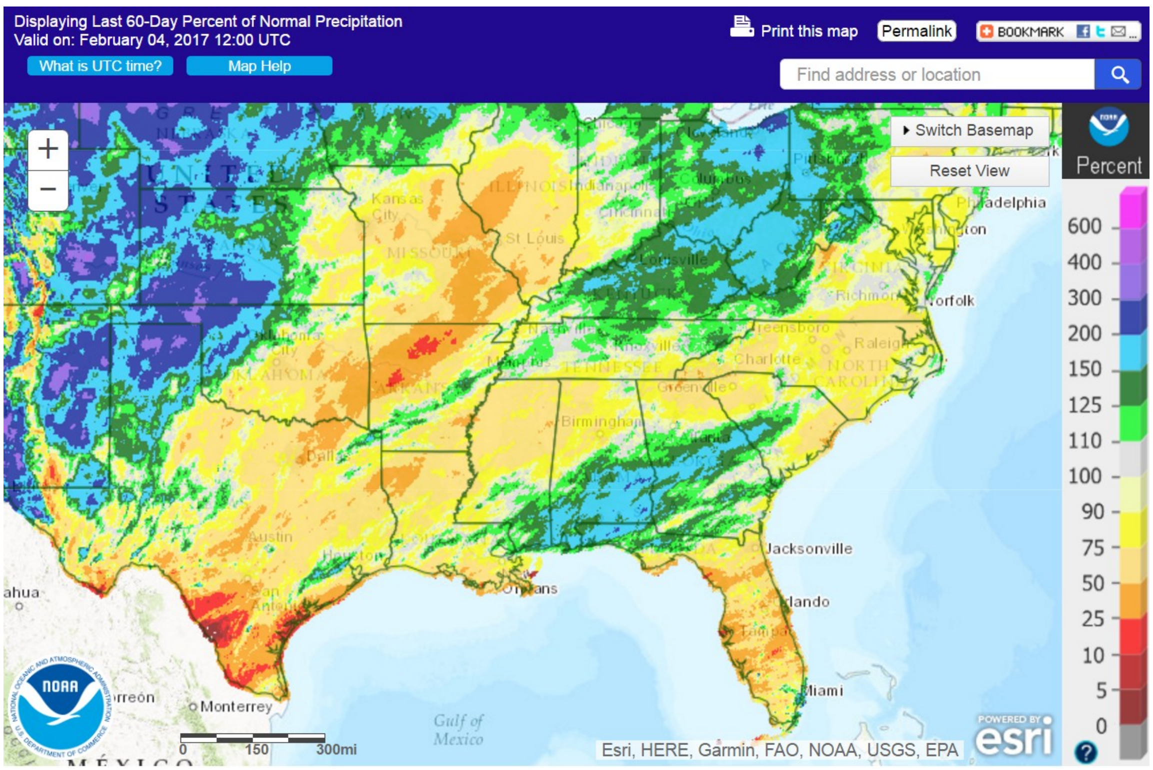


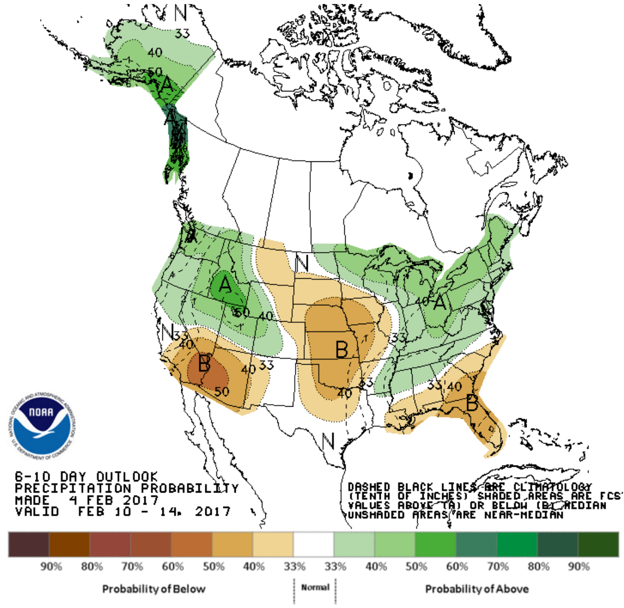
Figure 4. Map of 60 day percent of normal precipitation

Recurring periods of moderate to locally high rain activity and the subsequent continuing broad improvement in fuel moistures have minimized fire activity in January in most of the Southern Area except areas of far-western Oklahoma and west Texas. Existing dry/drier/drying conditions in these more western areas of the Southern Area, along with above average fine fuel loadings and anticipated periods of windy weather and dry line induced lower humidity, should produce a fuels environment increasingly receptive to ignition and fire spread. Fire managers should be monitoring any weather pattern changes which could broaden this area eastward.

PRECIPITATION OUTLOOK

The now weakening La Niña episode which has dominated the tropical Pacific since last year is expected to further weaken and transition to a warm-biased pattern by the end of the outlook period. These transition periods can produce a widely varying pattern of temperature and precipitation anomalies. Therefore, a high degree of uncertainty exists in the outlooks for this late winter and spring period. Taking this into account, the western states (i.e., Oklahoma and Texas) and the southeastern states (i.e., Georgia and Florida) of the Southern Area will see the highest potential for warmer and drier weather patterns.
Stratospheric warming currently in progress, will have the potential to produce deeper, colder air outbreaks through February with other more transient hemispheric conditions muting the coldest air possibilities.

Figure 5. Map of six to ten day precipitation forecast for the United States



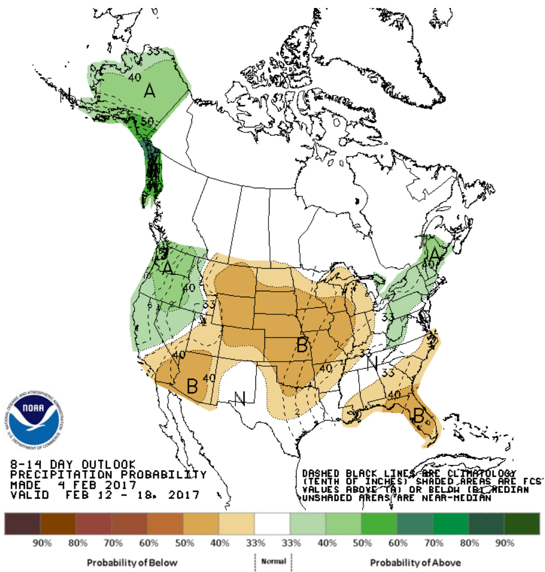


Figure 6. Map of eight to fourteen day precipitation forecast for the United States

For Puerto Rico, there is no particular signal in the weather pattern to indicate a category other than "average." Rain activity and amounts have begun to taper off during January across the southwest and southern island areas, so some fire activity and periods of elevated potential here would not be unexpected. These areas will need to be monitored.

There is some uncertainty to the long range weather forecast models as La Niña weakens and moves towards a neutral pattern. The experimental three to four week outlook from the Climate Prediction Center (CPC) indicates a higher than normal precipitation amount. The 30 day CPC forecast indicates a normal rainfall for much of the region and a below average forecast for the western part of the region. The 90 day forecast from the CPC indicates a below average chance of rain for the eastern part of the region.

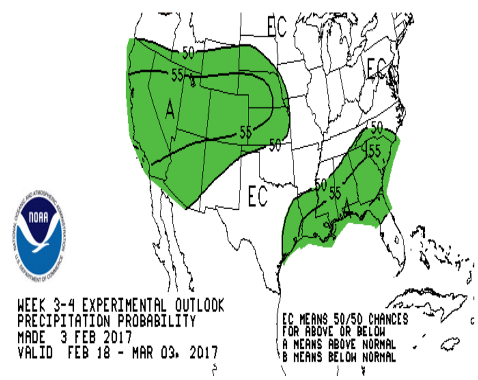


Figure 7. Map of three to four week precipitation forecast for the continental United States

Future weather patterns suggest any heightened potential would peak during March and early April in most of Texas and Oklahoma. For the southeastern states, particularly Georgia and Florida, the forecast is a warmer and drier trending weather pattern that will continue to prevail. This will likely produce periods of higher fire danger during the period before green-up or as vegetation transitions out of dormancy. Florida can experience multiple peaks of fire activity from February or March and again in May. Total acres burned historically peaks in May and June. Water levels at the Okefenokee National Wildlife Refuge are below average now and are cause for particular fire danger concerns if ample future rainfall or higher frequency rain activity fail to materialize.

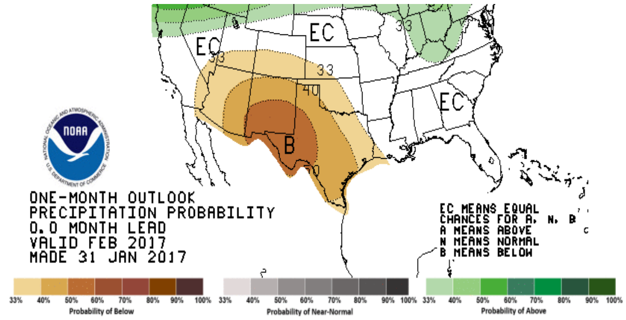


Figure 8. Map of thirty day precipitation forecast for the southern United States

The extreme southeast portion of the Southern Area will likely experience higher fire potential persisting into late spring. Average to above average overall fire activity is likely to continue through spring. Depending on the El Niño Southern Oscillation (ENSO) transition, a return to at least average is warranted during June. June is also the official start of the Atlantic tropical storm season.

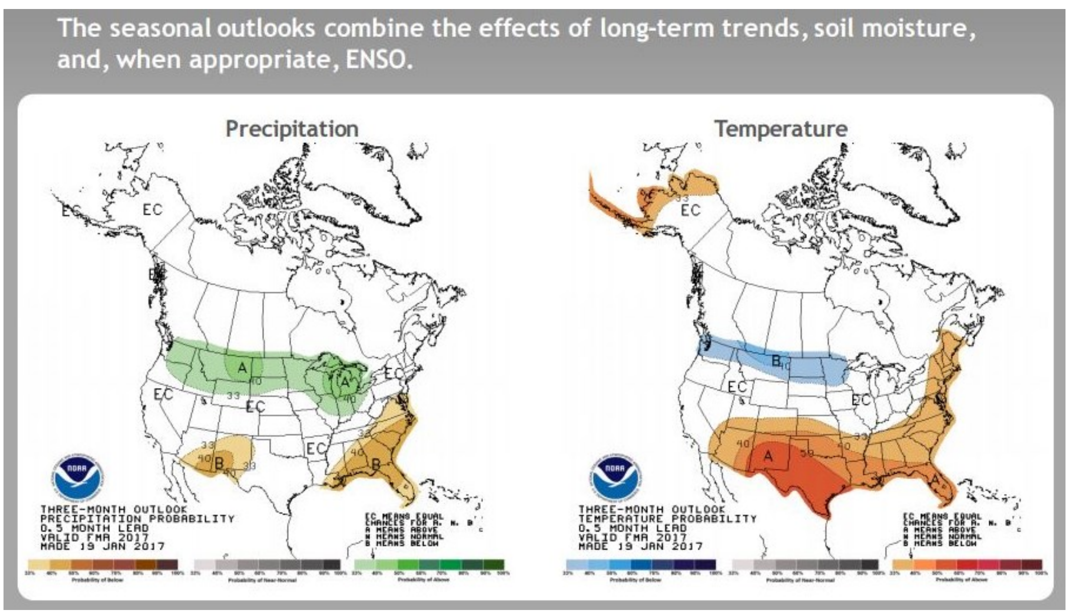
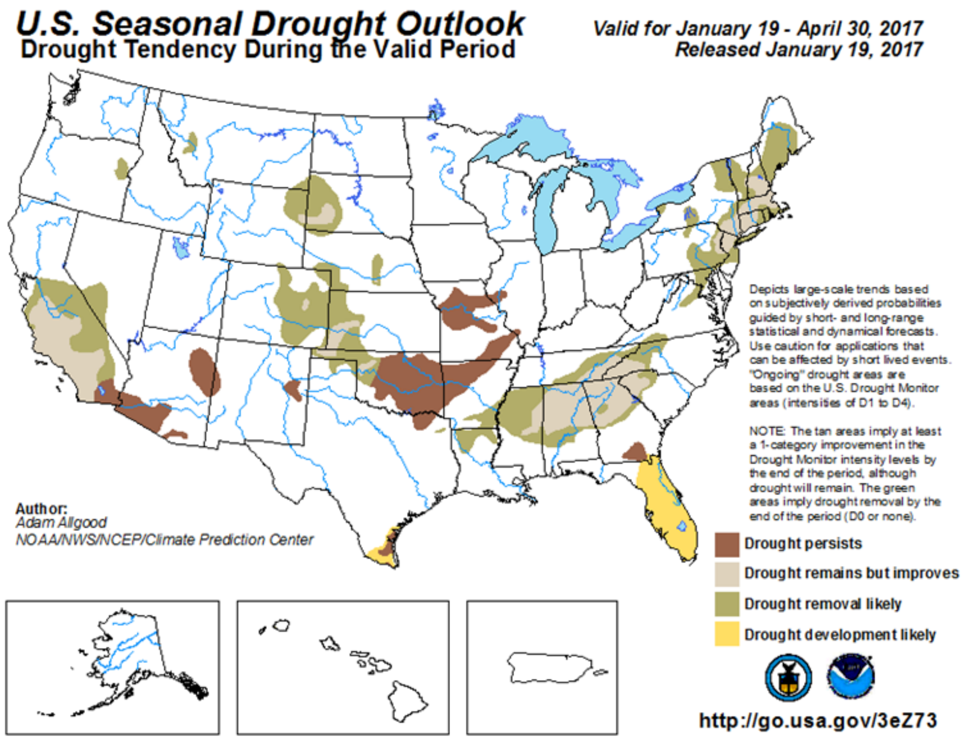


Figure 9. Map of three month precipitation and temperature forecast for the United States

For Oklahoma and Texas, fire risks will decrease in late April and early May with activity returning to “normal” (i.e., average activity levels) during the period.



The before-mentioned forecast information leads to the drought outlook in Figure 10. Currently, drought is forecasted to develop across a wide area of Florida and persist across much of Oklahoma and Arkansas.

Figure 10. Map of seasonal drought outlook for the United States

Fuel and Fire Danger Conditions

In order to isolate fire danger across the broad Southern Area, fuel and fire danger conditions have been separated into three subsections: Florida and coastal Georgia, central Texas and Oklahoma, and the central piedmont region.

Fuel and Fire Danger Conditions for Florida and Coastal Georgia

Exceptional drought occurred over a large portion of the Southern Area during the fall of 2017 with energy release component (ERC) values setting historical marks in most affected areas. As the predicted rains for the late fall and winter moved over the region, the fire danger in these areas began to normalize. However, areas of increasing fire danger for 2017 have started to become apparent. With the Bermuda high and the change in the ENSO oscillation, central Florida, including the panhandle, and southeastern Georgia have not been receiving their normal precipitation amounts. Although the National Fire Danger Rating System (NFDRS) indices don't show a sharp increase in fire danger, there are other indicators across these areas that warrant discussion and will begin to create an increase in the indices.

Current departure from normal rainfall, as shown in figures 11 and 12, indicate that a change in fuels conditions, albeit slow to react, will lead to higher than normal fire danger. Water levels across these areas using USGS stream gauge monitoring are at critically low levels. Figures 13, 14, 15, and 16 indicate that a majority of the stream gauges are recording near record low flow.

As a result, fire managers will need to practice careful observation of climatological breakpoints and how they correlate to NFDRS indices over the next 90 days because it will be key to fire suppression and prescribed fire operations. As fuels, water levels, and soil moisture begin to drop over this time period, ignition of prescribed fires will need to be monitored closely for long duration burns causing unwanted smoke impacts. Fires that initiate over this time period will begin to show high rates of spread, long-range spotting, and control issues. Extended period of mop-up may be needed to mitigate spread potential and wildfire or prescribed fire smoke issues.

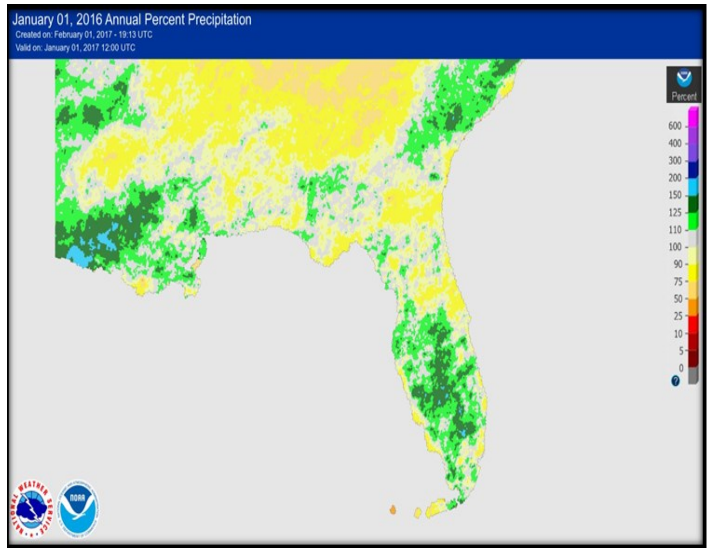


Figure 11. Map of annual precipitation for Florida and southeastern Georgia

In very general terms, extreme fire behavior can exist when two conditions are present. One of those conditions is the long term drying of fuels. The second condition results from daily fire weather (e.g., low humidity, high temperatures, and high winds), which when aligned can lead to large fire growth.

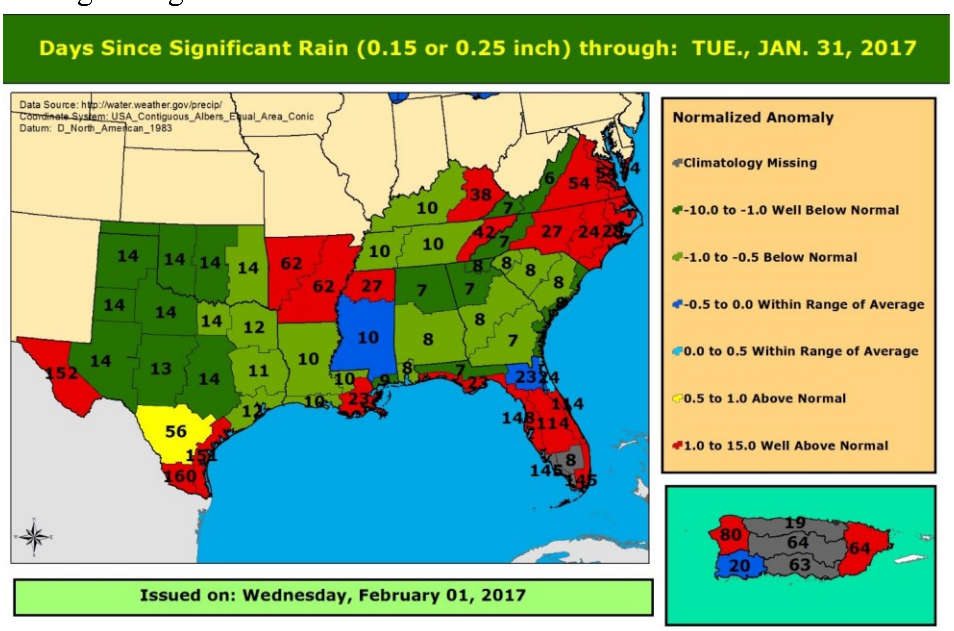


Figure 12. Map of the number of days since rain for the Southern Area. Central and northeastern Florida show the largest deficit

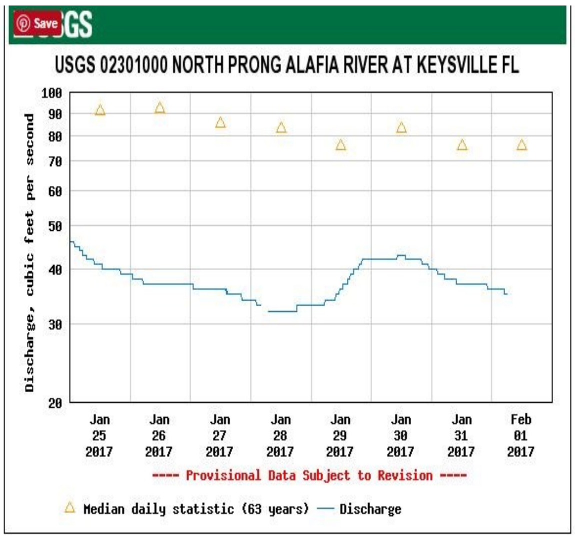
Stream flow rates vary across the state of Florida. The southern portion of the state has close to normal rainfall while the central and the northern portion are receiving less than normal.

Figures 13-15 highlight observed stream flow trends, and Figure 16 shows stream flow percentiles for Florida and southeastern Georgia.

Figure 13. Stream flow data for Ocala and central Florida. Current stream slow rates are well below the 25th percentile for 63 years of stream flow data

Daily discharge, cubic feet per second -- statistics for Feb 1 based on 63 years of record more

Min (2001)	Most Recent Instantaneous Value Feb 1	25th percen-tile	Median	Mean	75th percen-tile	Max (1966)
19	35	50	76	98	129	401



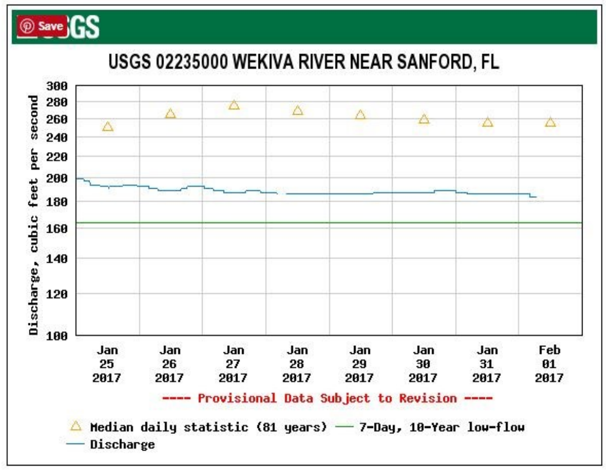


Figure 14. Stream flow data for the Apalachicola and eastern Florida. Current stream slow rates are well below the 25th percentile for 81 years of stream flow data

Daily discharge, cubic feet per second -- statistics for Feb 1 based on 81 years of record more

Min (1991)	Most Recent Instantaneous Value Feb 1	25th percen-tile	Median	Mean	75th percen-tile	Max (1961)
168	184	222	255	273	301	548

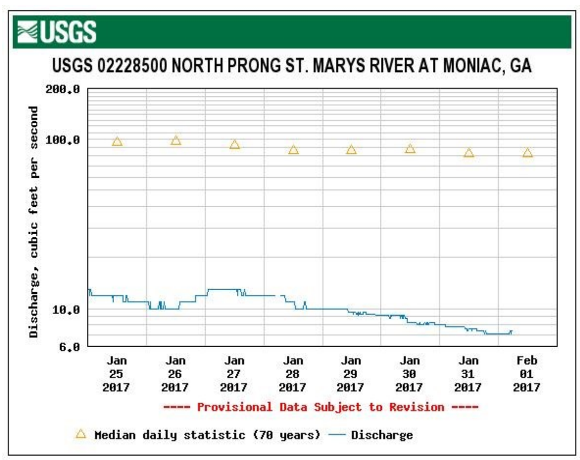


Figure 15. Stream flow data for Osceola and southeastern Georgia. Current stream slow rates are well below the 25th percentile for 70 years of stream flow data

Daily discharge, cubic feet per second -- statistics for Feb 1 based on 72 years of record more

Min (1934)	Most Recent Instantaneous Value Feb 1	25th percen-tile	Median	Mean	75th percen-tile	Max (1994)
0.10	7.4	27	83	170	218	1330

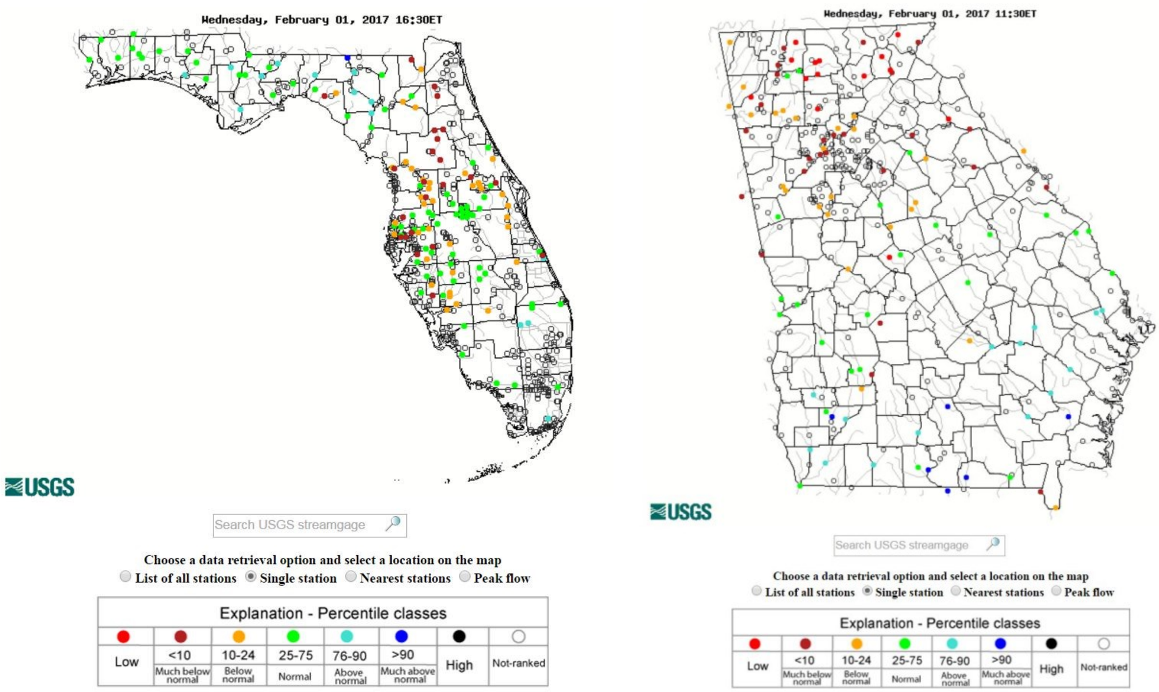


Figure 16. Map of stream flows for Florida and southeast Georgia

When comparing the current ERC, burning index (BI), and Keetch-Byram Drought Index (KBDI) to current fire danger conditions across this assessment area, there is not a definitive correlation to current wildfire danger. However, by using the rainfall and stream flow analysis, you can use current 1000 hour fuel moisture trends to predict the next 90 days and future danger outlook. The following 1000 hour index graphs show current conditions in comparison to a historically high fire danger year. It is observed that 1000 hour fuel moisture values have trended very closely with the year 2007. In this analysis, the year 2007 has been selected as an analog year due to the significant number of fires and acres burned in Florida that spring.

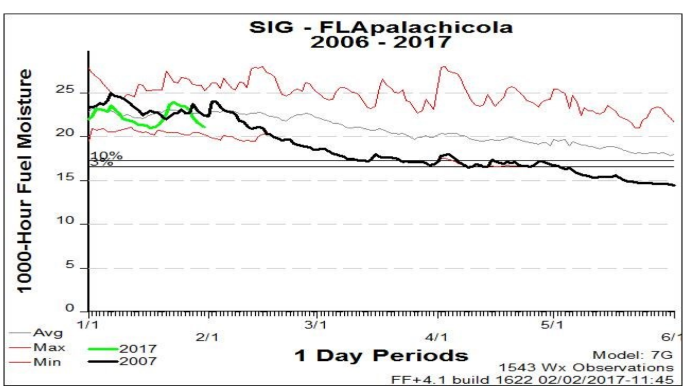


Figure 17. Graph of 1000 hour fuel moisture observed in the panhandle of north Florida

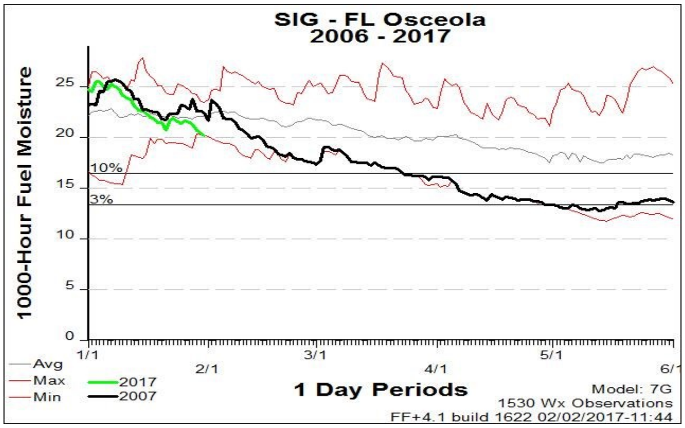


Figure 18. Graph of 1000 hour fuel moisture in north central Florida

Figure 19. Graph of 1000 hour fuel moisture in central Florida

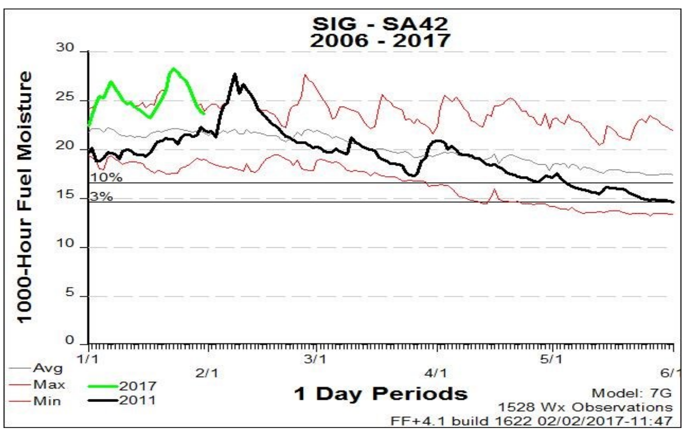


Figure 20. Graph of 1000 hour fuel moisture in southern Georgia

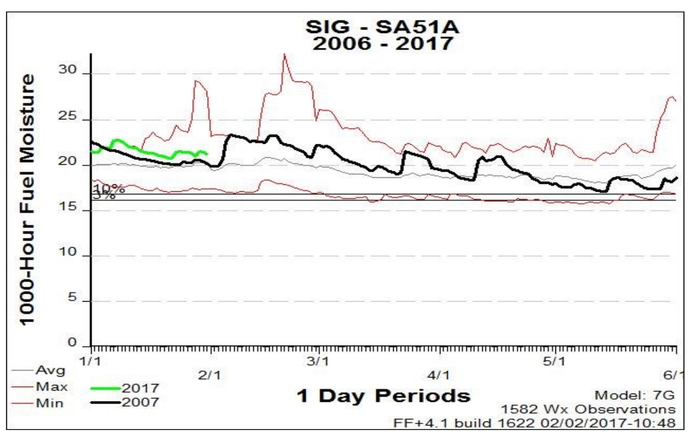


Figure 21. Graph of 1000 hour fuel moisture in southern Florida

Fuel and Fire Danger Conditions for Central Texas and Oklahoma

Over the past two climatological years, central Texas and Oklahoma have received above annual precipitation amounts resulting in an above average fine fuel load. Moving into late 2016 and 2017, the flow of moisture has subsided causing this abundance of fuels to dry out. Multiple hard freezes have also contributed to this situation. 1000 hour fuels are not showing signs of extreme conditions based on reports of fire managers across the assessment area; however, as the season persists, they will begin to dry out and cause fire control issues and long-term smoke impacts from prescribed fires. Currently, ERC indices show an above average to approaching the 90th percentile across the area. This will result in control issues, rapid rates of spread, frequent spotting into receptive fuel beds, and complete consumption of fuels down to the mineral soil.

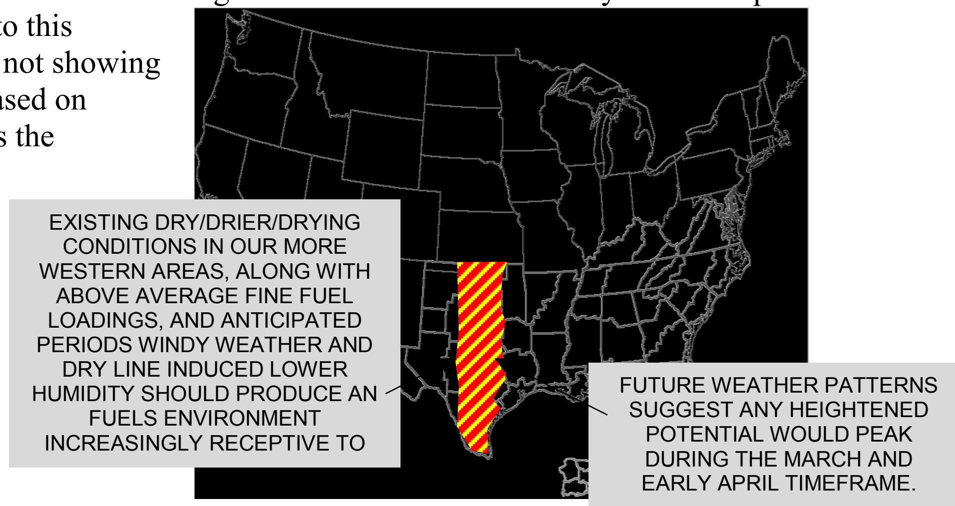


Figure 22. Map displaying areas of drying across Texas and Oklahoma

In very general terms, extreme fire behavior can exist when two conditions are present. One of those conditions is the long-term drying of fuels. The second condition results from daily fire weather (e.g., low humidity, high temperatures, and high winds), which when aligned can lead to large fire growth.

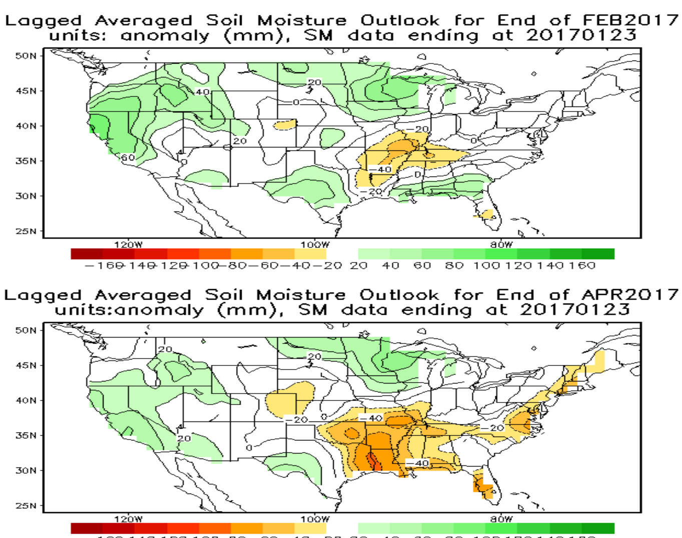


Figure 23. Map of February to April soil moisture outlook for the United States

The short-term moisture outlook in soils over the assessment area can be observed in figure 23. Currently soil moisture for the assessment area is not a concern; however, with any lack of moisture over the coming months, this will contribute to a higher wildfire risk potential. The outlook products show a 40% average deficit in soil moistures. Figure 24 correlates directly to the soil moisture deficit in Figure 23. Although there has been infrequent rain across the assessment area, the drought is still persisting in Oklahoma and will begin to spread into north and central Texas as the ENSO cycle beings to change.

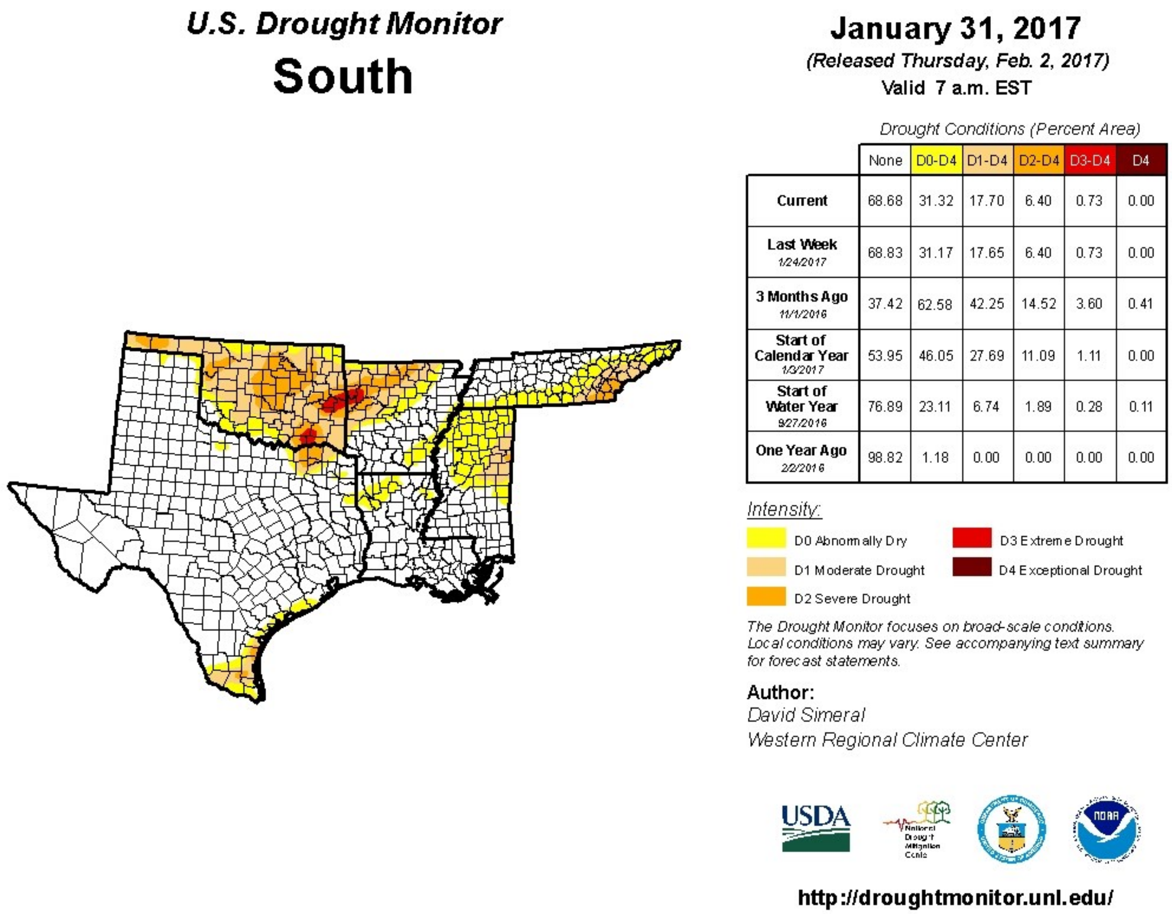


Figure 24. Drought Monitor for the southcentral United States. The monitor product is current as of January 31, 2017

Energy release component provides an index that is correlated with flammability of fuel and difficulty of suppression. ERC is often referred to as an indicator of fuel dryness. This index seems to be most useful for characterizing the seasonal severity of the fire season across the Southern Area. ERC for each Southern Area Predictive Service Area (PSA) can be calculated based on weather measurements taken at Remote Automatic Weather Stations (RAWS). Values above the 90th percentile are considered critical and represent fire danger that is only experienced less than ten percent of the time. Also, any ERC value that is close to the 97th percentile is closest to the record high ERC value, signifying that those areas are at record high fire danger values for that time of the year. The areas highlighted above the 90th percentile represent the most critical areas currently. However, based on forecasted weather patterns it is expected more areas of the region will become critical. Some areas of the region will likely see more ERC values reach record high levels over the next one to two months unless rainfall is received.

Figures 25-27 provide fire danger readings from some of the most critical areas across the Southern Area using ERC. The ERC graphs in figures 25-27 have the current year ERC value and an additional analog year overlaid for context. 2011 was a significant year in terms of wildfire occurrence and acres burned for both Texas and Oklahoma.

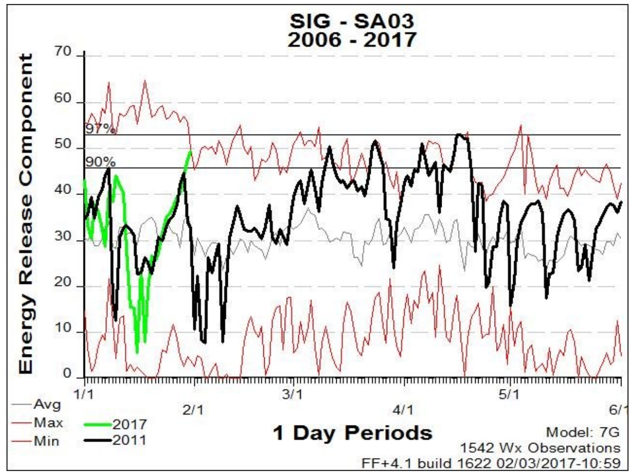


Figure 25. Graph of ERC values for 2011 and 2017 in central Oklahoma

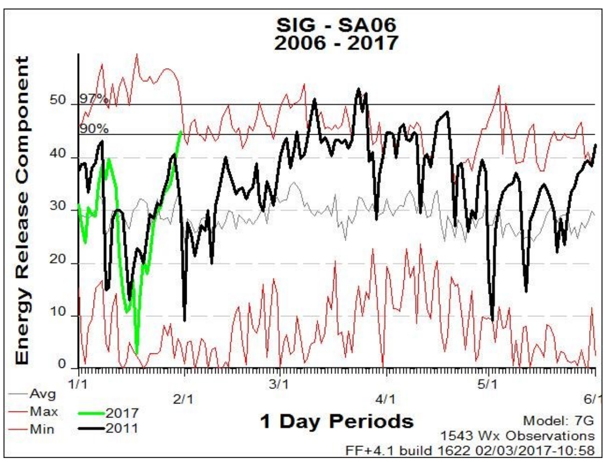


Figure 26. Graph of ERC values for 2011 and 2017 in northern Texas

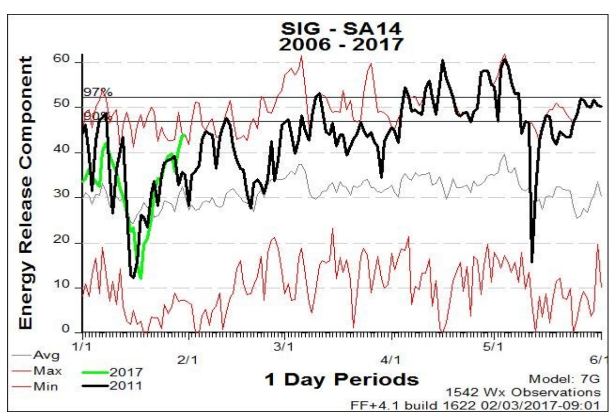


Figure 27. Graph of ERC values for 2001 and 2017 in central and southern Texas

Fuel and Fire Danger Conditions for Southern Appalachian Mountains and Central Piedmont Regions

2016 drought conditions across the central piedmont region created historical fire danger indices. As the late fall and winter rains materialized over the region, this rainfall only lead to short-term recoveries for fire danger indices. Figure 28 shows the current soil moisture deficits. Current analysis shows the region at a zero deficit. However, the soil moisture analysis for spring 2017 illustrates the region begins to show up to a 40 percent moisture deficit in the soil. What does this mean for fire danger and indices going into the fire season? 1000 hour fuels across the assessment area recovered only slightly from the drought conditions. Figures 17-21 show current 1000 hour fuel conditions compared to an above average spring fire season. Fire managers will need to monitor fuel conditions as the spring season progresses. Current reports from the field report the NFDRS indices are deceiving because fuels are still recovering from the long-term drought conditions. Prescribed fire operations will need to be monitored, as current and future conditions may lead to longer duration burns, negative smoke impacts, and possibly greater mortality than planned. In terms of wildfire activity, this could result in control issues, rapid rates of spread, frequent spotting into receptive fuel beds, and complete consumption of fuels down to the mineral soil.

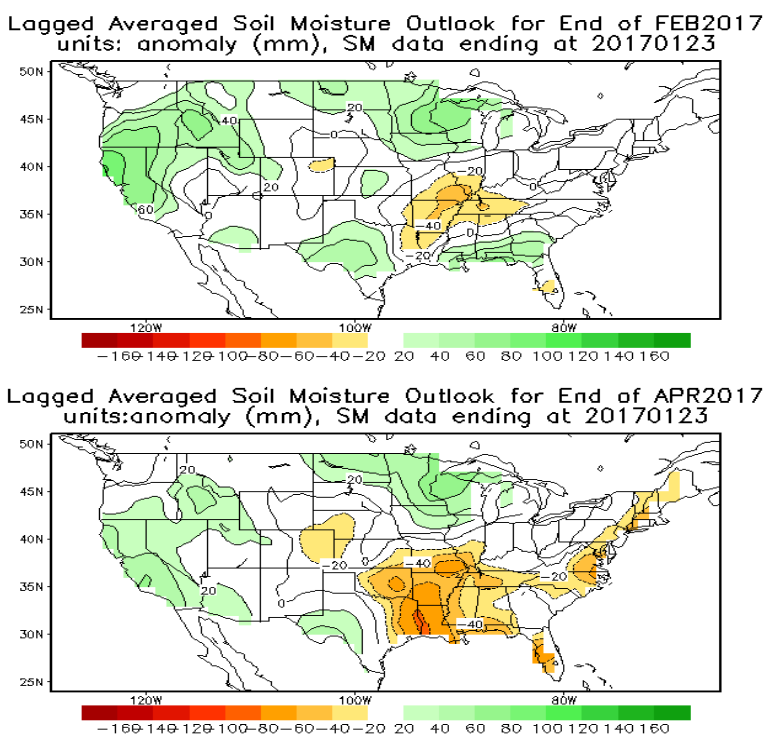


Figure 28. Map of soil moisture outlook for February and March-April for the continental United States

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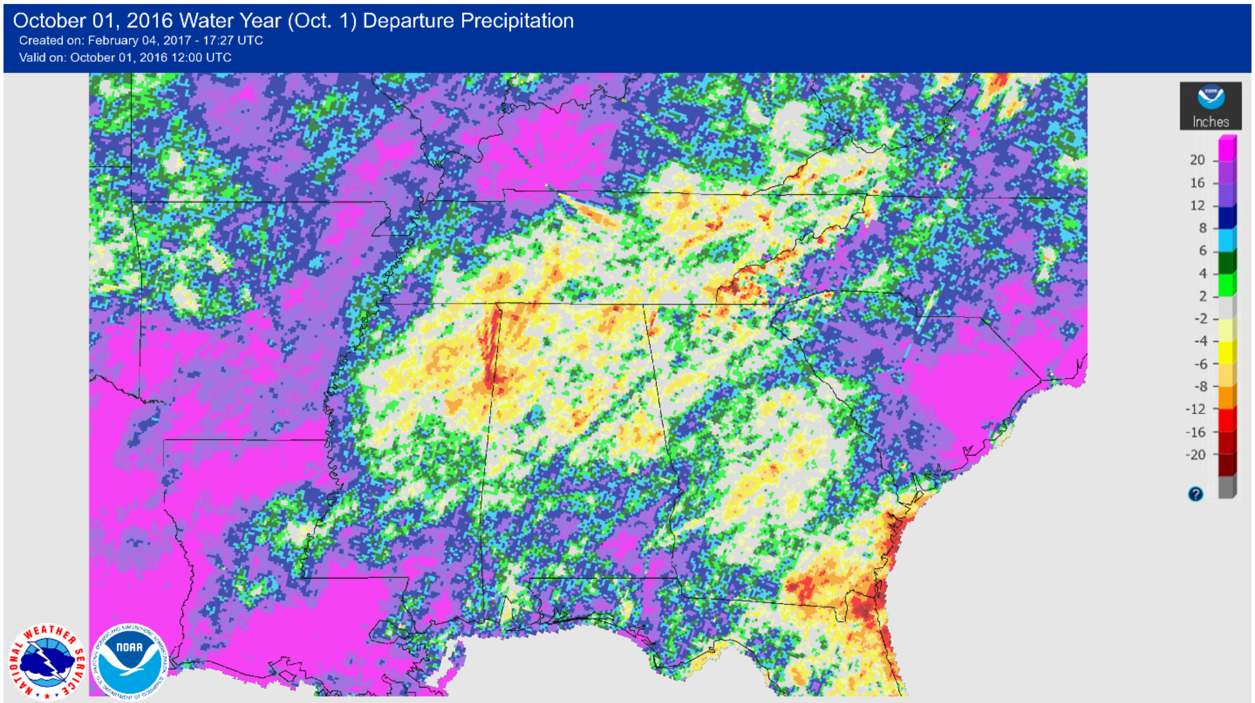
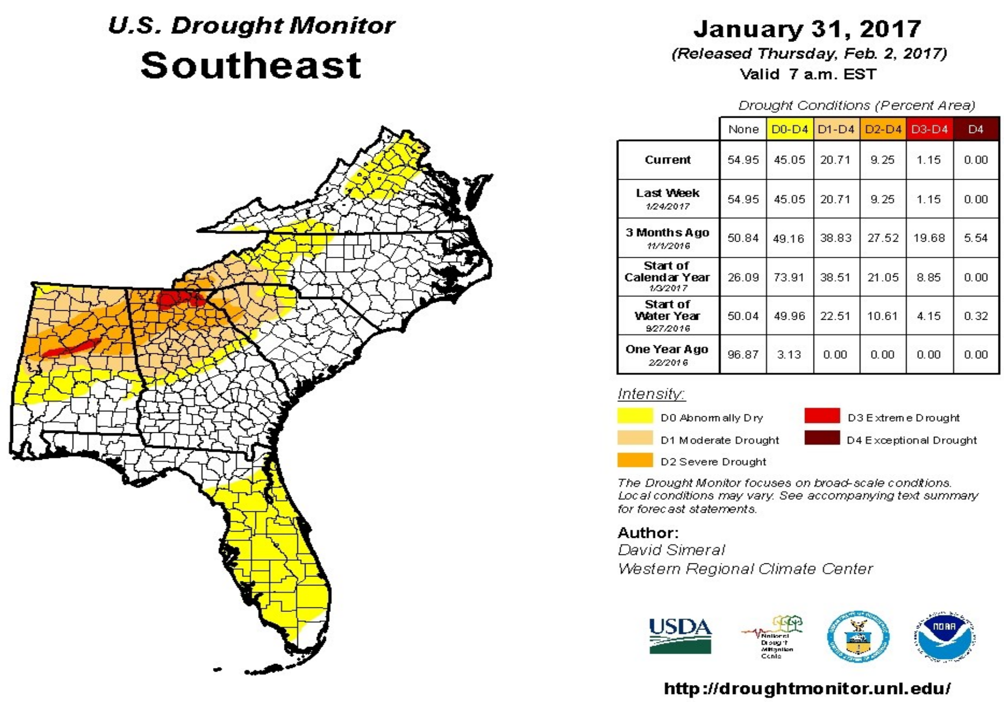


Figure 29. Map of 2016 rainfall departure from normal for the South. The piedmont assesment area was between 4-16 inches below annual historical average precipitation. Fall and winter rains help to moderate the conditions; however, there was not enough rain to remove the area from drought conditions



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	54.95	45.05	20.71	9.25	1.15	0.00
Last Week 1/24/2017	54.95	45.05	20.71	9.25	1.15	0.00
3 Months Ago 11/1/2016	50.84	49.16	38.83	27.52	19.68	5.54
Start of Calendar Year 1/3/2017	26.09	73.91	38.51	21.05	8.85	0.00
Start of Water Year 9/27/2016	50.04	49.96	22.51	10.61	4.15	0.32
One Year Ago 2/2/2016	96.87	3.13	0.00	0.00	0.00	0.00

Figure 30. U.S. Drought Monitor for the southeastern United States. The monitor product is current as of January 31, 2017

Figures 31-40 provide fire danger readings from some of the most critical areas across the Southern Area using energy release component. The ERC graphs in figures 31-40 have the current year ERC value and an additional analog year overlaid for context. These analog years provide some perspective on current conditions in relation to years identified as historically significant (in terms of wildfire occurrence and/or acres burned).

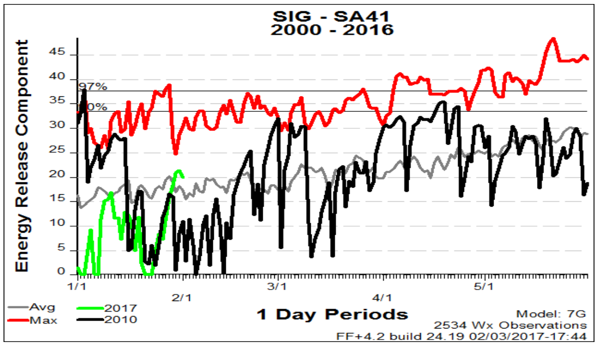
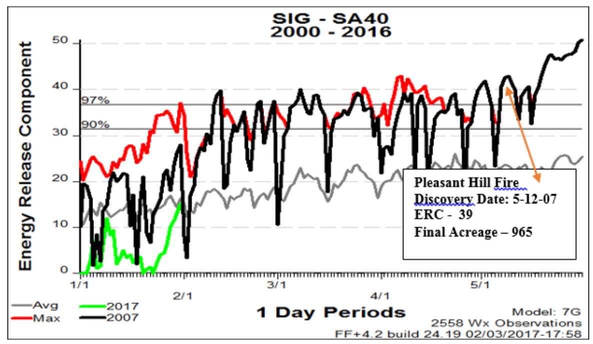


Figure 31. Graph of ERC values for 2010 and 2017 in central Georgia

Figure 32. Graph of ERC values for 2007 and 2017 across the northwestern Georgia mountains



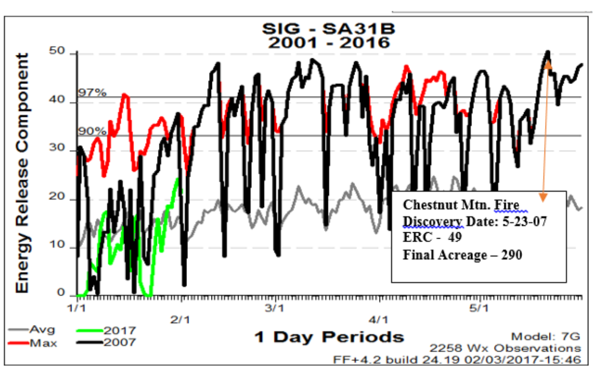
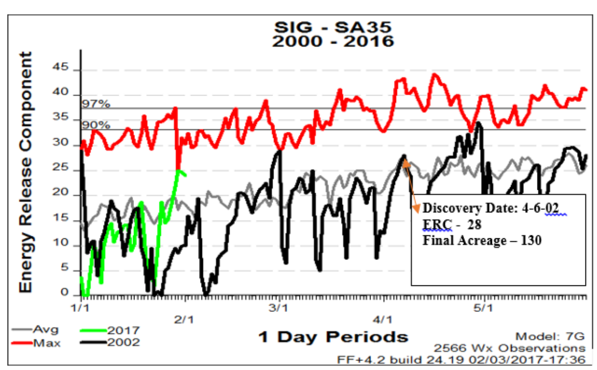


Figure 33. Graph of ERC values for 2007 and 2017 across the north Georgia mountains

Figure 34. Graph of ERC values for 2002 and 2017 across the central South Carolina piedmont



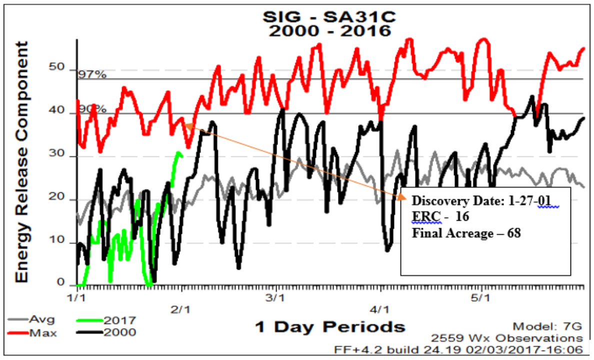
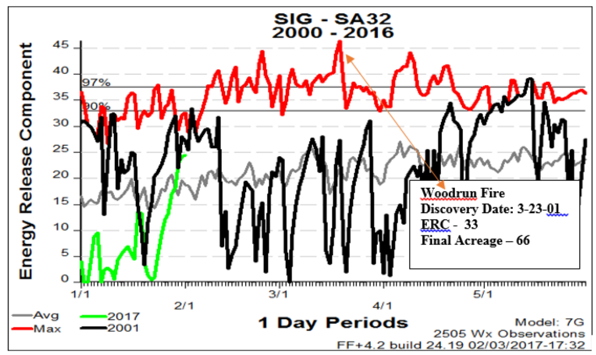


Figure 35. Graph of ERC values for 2000 and 2017 across the South Carolina mountains

Figure 36. Graph of ERC values for 2001 and 2017 across the North Carolina piedmont



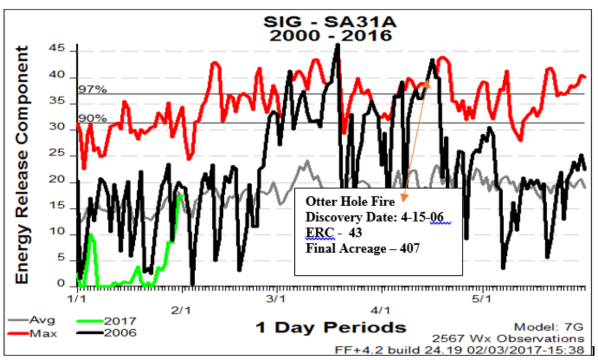
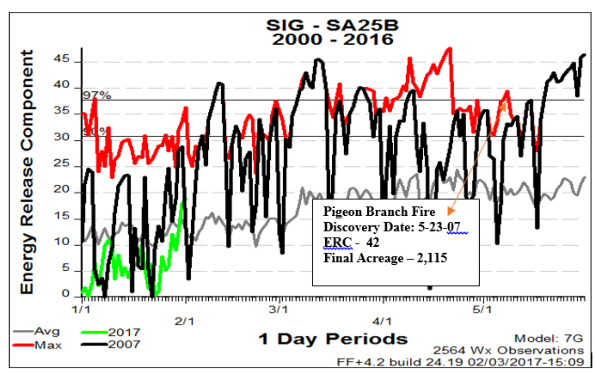


Figure 37. Graph of ERC values for 2006 and 2017 across the North Carolina mountains

Figure 38. Graph of ERC values for 2007 and 2017 across the Tenneessee mountains



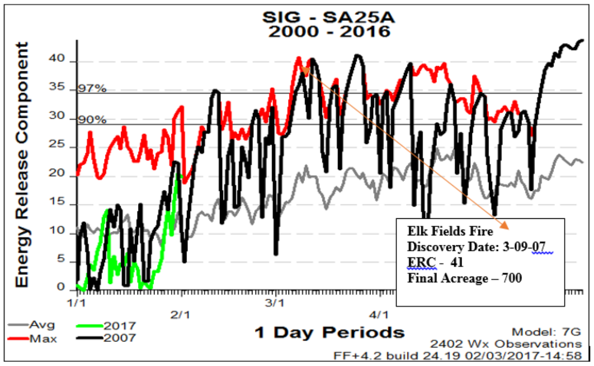


Figure 39. Graph of ERC values for 2007 and 2017 across central Tennessee

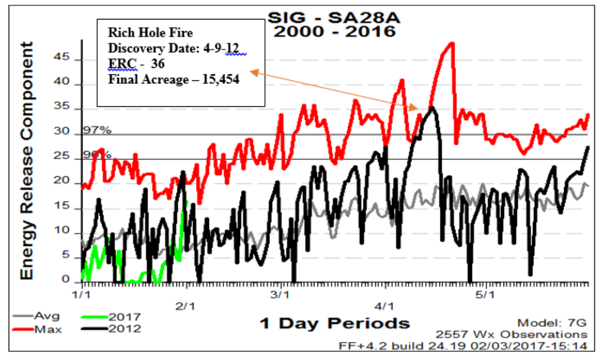


Figure 40. Graph of ERC values for 2012 and 2017 across the southwestern mountains of Virginia

Current Summarized Observations by Fire Managers

E.J. Bunzendahl – Assistant Forest Fire Management Officer, Daniel Boone National Forest

Eastern Kentucky has received above average precipitation over the winter months but has also had above average temperatures. We are starting February with drier than average 100 and 1000 hour fuels as well as ERC values approaching the 90th percentile. The Kentucky Division of Forestry has already started having fires with the most intensity being in the fine, flashy fuels. While heavy fuels are drier than average, they have not yet been fully available due to moisture conditions in the surrounding carrying fuels.

Peter Goetzinger – Forest Fire Management Officer, National Forests and Grasslands in Texas (NFGT)

The NFGT have primarily been fluctuating between low to moderate. Dry days, poor overnight recoveries, and elevated wind speeds are primary contributing factors to elevated indices and increased fire activity. In the event that Texas remains dry, fire activity by the middle to the end of March could dramatically increase. Fires would start becoming more difficult to suppress. If average precipitation were to occur, then an average fire load would be anticipated with fire being suppressed with little resistance.

Mike Bot – Acting Forest Fire Management Officer, Cherokee National Forest

Coming out of the 2016 fall fire season where Cherokee National Forest experienced a significant drought situation and record setting fuels conditions, the weather patterns shifted into a more favorable pattern starting the second week of December. Since that time, the KBDI has rebounded. If the forest experiences any prolonged periods without precipitation, it is likely the fuels will react much faster than typically encountered. This scenario would cause higher than normal fire danger and will warrant additional suppression resources.

Ken Gordon – Fire Planner, National Forests in Florida
Comparing this spring against 2007 and 2011, which were both big fire years for Florida, fuels and indices are above where they were at this time in each of those years. We are expecting an early and active season. The area south of the Ocala National Forest has already experienced elevated fire danger. The Osceola National Forest has recently stopped conducting prescribed fires until conditions improve.

Brad Smith – Texas A&M Forest Service
Pre- and post-frontal conditions can cause rapid fire growth as the wind speed increases and changes direction and the RH values drop. One good indicator to monitor would be the departure from normal rainfall over 60 days. Southeast Texas along the Rio Grande is still holding some moisture, but with temperatures in the low 80's, spring and green-up will come quick. As far as east and northeast Texas in the piney woods, pay close attention to the winds, ERC, and BI.

Fire Behavior

The analysis of potential fire behavior has been divided into three geographical assessment areas: eastern Texas and Oklahoma, Florida and southern Georgia, and the piedmont and mountains of the Southern Area. Utilizing BEHAVE, Fuel Modeling Comparison, and local intelligence, a fire behavior assessment was completed using six distinct fuel models (SH8, SH4, TL6, TU2, GR3, and GR4) and slope classes (0, 20, 50, 75, and 100) that are common throughout the assessment areas. Based upon current and historical observed fuel moistures throughout the assessment area, considerably low fuel moisture percentages were the same for each fuel model (1 hour at 5%, 10 hour at 7%, 100 hour at 9%, herbaceous live at 30%, and woody live at 80%). The analysis was conducted to provide fire managers a perspective of the potential fire intensities and spread characteristics that they may be presented with this season, so they can adequately plan for the types and quantities of suppression resource needs to effectively and safely respond to wildfires.

Oklahoma and Texas
The analysis for Oklahoma and Texas was completed utilizing three fuel models (GR3, GR4 and SH8) that represent the majority of the assessment area. With the complete curing from herbaceous growth and an above average fine dead fuel loading, combined with the persistent drought conditions across Oklahoma, conditions are prime. Firefighters should expect to face increasing occurrence, rapid rates of spread, and more complex initial attack. A fuels and fire behavior advisory for Oklahoma can be found at http://www.forestry.ok.gov/firedanger. Managers and firefighters should remain cognizant of weather conditions that may affect fire behavior especially pre- and post-frontal winds and RH values. An ERC value greater than the 75^{th} percentile and low live foliar moistures are good indicators of passive and active crown fire within the pine plantations of east Texas and southeastern Oklahoma.
Tables 2-4 identify the lowest and highest fire behavior characteristics that can be expected under moisture, wind speed, and slope classes.

Fuel Model GR3	Slope 0%		Slope 100%	
Wind Speeds	Low 2 mph	High 25 mph	Low 2 mph	High 25 Mph
Flame Lengths (ft)	5	15	10	15
Rate of Spread (Ch/Hr)	27	264	121	264
Fireline Intensity (Btu/ft/s)	205	2015	922	2015

Table 2. Fire behavior characteristics for GR3 fuel model

Fuel Model GR4	Slope 0%		Slope 100%	
Wind Speeds	Low 2 mph	High 25 mph	Low 2 mph	High 25 Mph
Flame Lengths (ft)	6	26	13	26
Rate of Spread (Ch/Hr)	31	853	187	853
Fireline Intensity (Btu/ft/s)	251	6890	1512	6890

Table 3. Fire behavior characteristics for GR4 fuel model

Fuel Model SH8	Slope 0%		Slope 100%	
Wind Speeds	Low 2 mph	High 25 mph	Low 2 mph	High 25 Mph
Flame Lengths (ft)	6	25	15	28
Rate of Spread (Ch/Hr)	9	155	47	193
Fireline Intensity (Btu/ft/s)	371	6386	1922	7937

Table 4. Fire behavior characteristics for SH8 fuel model

Florida, south Georgia, and coastal plains of the Carolinas

Using 2007 (which included Bugaboo Scrub, Sweat Farm Road, and Big Turn Around Fires) and 2011 (included Sweat Farm Road Again Fire) as analog years, current fuels conditions and fire danger indices are trending above where they were on this date in both 2007 and 2011. Fire managers are expecting an early and very active spring fire season from south Georgia to south Florida. The coastal plains of SC are already experiencing large fires.

Managers and firefighters should remain cognizant of weather conditions that may affect fire behavior especially post-frontal winds and RH values. Shifting winds in the afternoon as sea breezes and land breezes interact and outflow winds from developing thunderstorms on this convergence line can drastically change observed fire behavior. Closely monitor the forecasted burning index (BI), ERC, wind speeds, soil moisture, and the water levels in the streams and swamps. Fires may require frequent patrol and extensive mop up especially if organic fuels are involved. The fire behavior analysis was completed for this area utilizing the SH4 and SH8 fuel models.

Fuel Model SH4	Slope 0%		Slope 100%	
Wind Speeds	Low 2 mph	High 25 mph	Low 2 mph	High 25 Mph
Flame Lengths (ft)	5	22	10	23
Rate of Spread (Ch/Hr)	11	317	62	368
Fireline Intensity (Btu/ft/s)	153	4466	1874	5187

Table 5. Fire behavior characteristics for SH4 fuel model

Fuel Model SH8	Slope 0%		Slope 100%	
Wind Speeds	Low 2 mph	High 25 mph	Low 2 mph	High 25 Mph
Flame Lengths (ft)	6	25	15	28
Rate of Spread (Ch/Hr)	9	155	47	193
Fireline Intensity (Btu/ft/s)	371	6386	1922	7937

Table 6. Fire behavior characteristics for SH8 fuel model

Piedmont and mountains of the Southern Area

On the heels of a historic fall fire season across the mountains of the Carolinas, Georgia, and Tennessee, conditions have improved some, but the rain deficit still remains. Currently, fuels fall within normal seasonal conditions across the Appalachian Mountains. Several large late season fires have already occurred across north Georgia and North Carolina.

With fire potential forecasted to be average to below average for Tennessee and Kentucky, managers should still closely monitor their fuels conditions and current indices on their local units. Dry cold front passages combined with post-frontal winds and low RH values may produce periods of elevated fire danger and observed fire behavior. As the chemical content in rhododendron and mountain laurel changes around April, be mindful that those fuels are capable of producing erratic and extreme fire behavior when combined with slope and wind. If fires become established within a thermal belt, be aware that they can burn actively through the night. The fire behavior analysis was completed for the assessment area utilizing the TL6 and TU2 fuel models.

Fuel Model TL6	Slope 0%		Slope 100%	
Wind Speeds	Low 2 mph	High 25 mph	Low 2 mph	High 25 Mph
Flame Lengths (ft)	2	8	4	8
Rate of Spread (Ch/Hr)	2	55	13	62
Fireline Intensity (Btu/ft/s)	18	468	109	529

Table 7. Fire behavior characteristics for TL6 fuel model

Fuel Model TU2	Slope 0%		Slope 100%	
Wind Speeds	Low 2 mph	High 25 mph	Low 2 mph	High 25 Mph
Flame Lengths (ft)	3	9	5	9
Rate of Spread (Ch/Hr)	10	91	31	91
Fireline Intensity (Btu/ft/s)	78	708	242	708

Table 8. Fire behavior characteristics for TU2 fuel model

Fire Occurrence

Because of ongoing and increasing drought conditions with mostly moderate to high fire activity, areas of concern for potentially higher fire trending risk include: northwest Texas, southeast Georgia, southern Alabama, North Carolina, South Carolina, and Florida. Figures 41-47 highlight a ten year fire occurrence trend during late winter and spring months from 2006-2016. Figure 41 shows 2007 was a significant year, in terms of ignitions and acres burned. Numerous large fires emerged in Florida towards April and May.

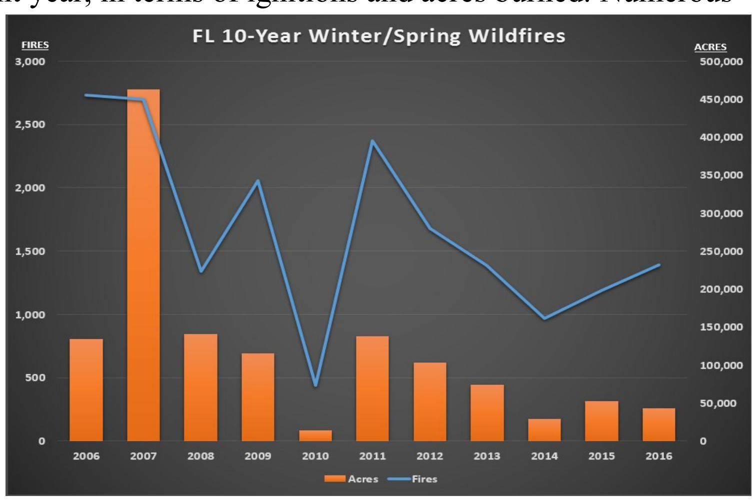


Figure 41. Graph of the number of fires per year from 2006-2016 as reported on federal lands in Florida

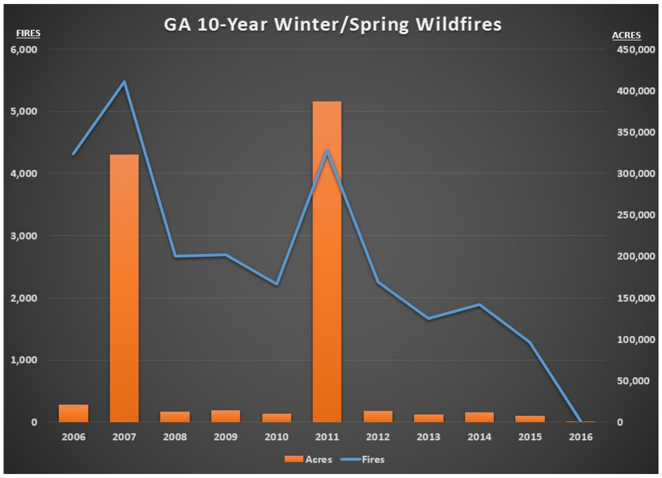


Figure 42 highlights both 2007 and 2011 as being historically significant. Rainfall deficits of 40 days or longer without significant precipitation in southeastern and northern Georgia contributed to several large fires emerging including the Sweat Farm Road and Big Turnaround Complex.

Figure 42. Graph of the number of fires per year from 2006-2016, as reported on federal lands in Georgia

Figure 43 demonstrates that the spring of 2011 was historically significant. The occurrence of fire ignitions in North Carolina was at its highest in 2011. Much of the Southern Area experienced below normal precipitation. Wet weather patterns in 2015 kept fire activity below normal during late winter into spring of 2015.

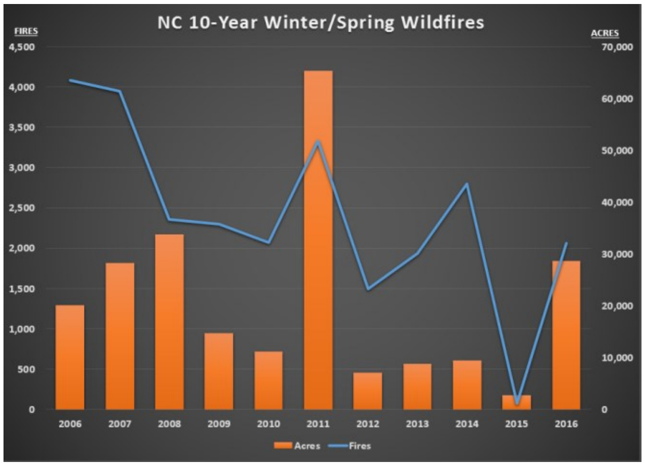


Figure 43. Graph of the number of fires per year from 2006-2016, as reported on federal lands in North Carolina

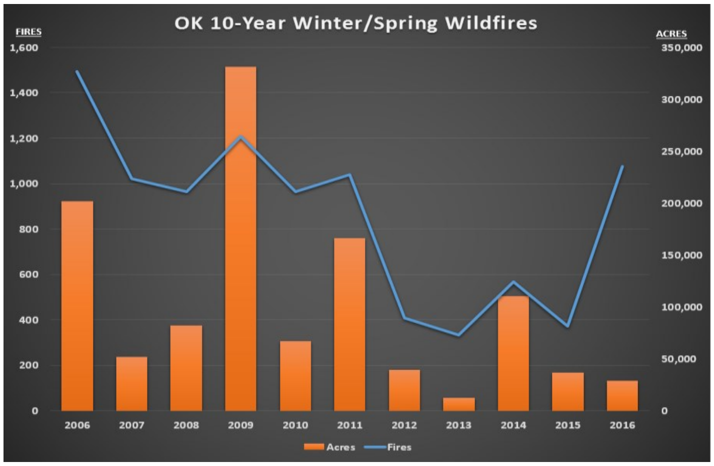


Figure 44 highlights 2009 as being a historically significant spring in Oklahoma with nearly 350,000 acres burned. Frequent winter storms moved through Oklahoma and much of the Midwest, bringing wet spring conditions in 2013.

Figure 44. Graph of the number of fires per year from 2006-2016, as reported on federal lands in Oklahoma

As observed in Figure 45, 2009 and 2011 show the highest fire occurrence, in terms of acres burned, in the past ten years. The largest fire for South Carolina during the spring season was an unnamed fire that was suppressed at 765 acres.

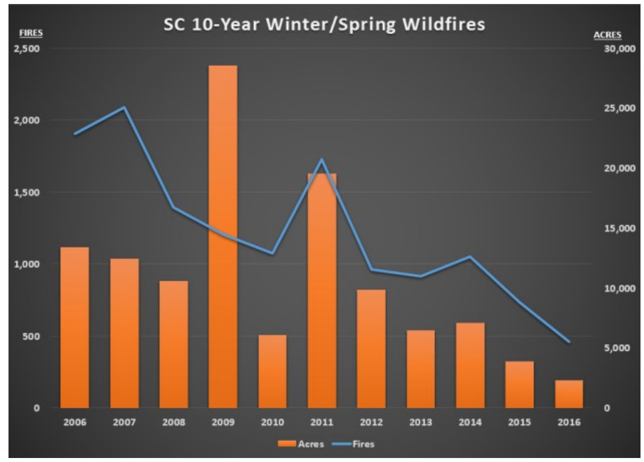


Figure 45. Graph of the number of fires per year from 2006-2016, as reported on federal lands in South Carolina

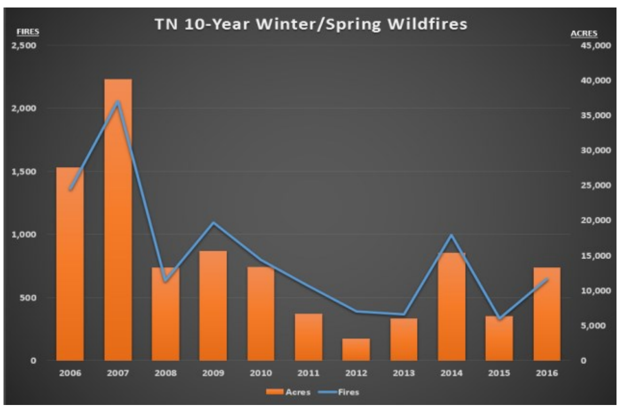


Figure 46. Graph of the number of fires per year from 2006-2016, as reported on federal lands in Tennessee

Figure 46 highlights the late winter and spring season of 2007 as being historically significant seasons. The Pigeon Branch fire burned over 2,000 acres during the late spring season on the Cherokee National Forest.

Figure 47 highlights the spring of 2011 as being an extremely significant spring season in Texas. Precipitation deficits and above normal temperatures contributed to an above normal fire season. High temperatures quickly transitioned fuels across Texas through green-up and into a cured state.

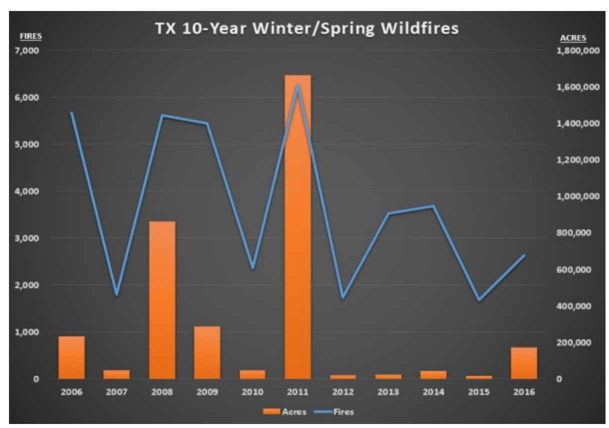


Figure 47. Graph of the number of fires per year from 2006-2016, as reported on federal lands in Texas

Summary

- The 2016 fall fire season was unprecedented and those drought conditions, although improved, are amplified with lack of normal rainfall.
- Central Florida, including the panhandle, and southeastern Georgia, have not been receiving their normal precipitation amounts. Florida and southeastern Georgia could experience a significant spring fire season. Fire danger indices are currently trending with values experienced in 2007, which was a significant season.
- Complete curing of the vigorous herbaceous growth from the growing season has resulted in an above normal fine fuel loading. Expansion and intensification of drought has produced very dry large fuels. The weak La Niña effects of warmer and drier than normal conditions punctuated by brief cold snaps combined with poor soil moisture have intensified dormancy of cool-season grasses and forbs and increased their availability to contribute to fire spread. Oklahoma released a statewide fuels and fire behavior advisory in early February.
- The southern Appalachians and piedmont of the Atlantic coast are still experiencing the effects of drought. The current La Niña event is weak and will probably transition to a neutral phase in the coming months, and this transition coupled with current drought conditions make forecasting fire danger difficult. The US Drought Monitor shows drought improvement or removal likely for the Appalachians and piedmont through the end of April.
- Actual fire occurrence, in terms of number of fire ignitions, is average for the time of year. Oklahoma, thus far, is experiencing a surge in activity.
- As green-up begins to occur, additional moisture will be removed from the soil. Monitoring of rainfall frequency and departure from normal precipitation will be vital to track drought conditions.
- Fire behavior across the Southern Area will vary greatly, depending on fuel types, fuel conditions, and changing weather conditions; fire behavior will cover the gamut from creeping and smoldering to possible sustained crown runs. Increased fire behavior will be strongly correlated with an unstable atmosphere, low relative humidity values, and winds greater than 10 mph. Single and group tree torching may produce short and long-range spotting, which will factor into fire spread especially when fine fuels are receptive to spotting. Managers and firefighters should closely monitor their fuel conditions this season and remain cognizant of changes in the weather, particularly the winds associated with frontal passages and relative humidity values.
- The frequency of precipitation events is critical to staying out of an extended fire season. These events need to take place on a five to seven day cycle.

Conclusions

Most Likely Case Probability – 70%
The spring fire season in Florida, Texas, and Oklahoma is significantly active. High fine dead fuel loading is already supporting large fire growth in Oklahoma. The season is longer than normal due to the current drought, fuels conditions, and predicted weather pattern. Some additional aviation and ground resources are required due to fire behavior. Mobilization of resources to these critical areas, from across the Southern Area, occurs. Several Type III incidents occur at the same time in the Southern Area. There would be a higher probability of some of these Type III incidents transitioning to Type II or even Type I. However, no large scale mobilization of out-of-region resources are required due to at least some mitigating weather pattern (i.e., high humidity or periodic rainfall).

Best Case Probability – 20%
The transition from La Niña to neutral conditions promotes normal rainfall pattern development. This brings frequent rainfall events and enough moisture to mitigate rainfall deficits across the Southern Area. Rainfall activity occurs at a high enough frequency that fuel dryness is minimized with a resulting lower than average wildfire occurrence.

Worst Case Probability – 10%
Rainfall frequency and amounts are little and strong; dry cold fronts bring significant fire weather. Moderate to severe drought conditions and extreme fire weather events result in numerous large fire incidents and heavy initial attack workload. Lack of rainfall, coupled with this long-term drought and minimal green-up, leads to an extended spring fire season. These areas experience a well above average spring fire season, including numerous extended attack (Type I and II) fires. Large scale mobilization of out-of-region resources occurs.

Recommendations

- This spring assessment has been completed prior to the typical fire season. As we move closer to and enter the spring fire season, managers should maintain situational awareness of current and trending conditions. Forecasting during a seasonal transition from La Niña to neutral conditions is difficult.
- The 2016 fall fire season was unprecedented and those drought conditions, although improved, are amplified with lack of normal rainfall. Fire personnel must remain cognizant of these conditions and monitor any voids in normal rainfall frequency.
- Fire managers will need to monitor fuel conditions in the assessment areas. This will become more important as the fire season and prescribed fire season start to blend together.
- Wildfire operations could evolve from normal operations to larger scale and more complex as the spring continues. Do not expect any fire to be routine. Be prepared to utilize indirect tactics with extended mop-up. Utilize aerial supervision to help direct crews and keep them informed on fire behavior. Ensure that LCES is in place before

engaging on any fire. Remember to STOP, THINK, and TALK before you ACT… and actively look for ways to minimize risk to firefighters in what is forecast to be a period of very high fire danger.

- Ensure out-of-region resources are briefed on current and past (2016) conditions. Utilize pocket cards showing current situation and the WFAS mobile severe fire weather mapping program to stay current on conditions (http://m.wfas.net/).
- Monitoring of personnel stress and rest will be important as the spring progresses. The 2016 fall fire season was historic in the Southern Area, and resources have observed minimal rest prior to the spring 2017 wildfire season.
- Implementation of prescribed fire operations will also need to be monitored. Fuel conditions will dictate fire behavior and smoke management procedures. The Ocala and Osceola National Forests in Florida have already suspended prescribed fire operations due to adverse fuels conditions.
- Fire managers will need to continue to monitor prescribed fire parameters. Mindful selection of burn units will be important if drought conditions worsen. Engage in a risk dialogue with field personnel and leadership on ceasing or continuing prescribed fire operations. Daily discussion on resource needs for prescribed fire and suppression operations will be important.
- Fire managers should be prepared to support periods of more frequent fire occurrence and the potential for more complex, longer duration wildfire incidents.
- Maintain capabilities to mobilize Type III teams.
- Augmentation of initial attack resources will likely be required throughout the late winter and spring. This will result from increased fire behavior, fire spread, and longer mop-up times due to drought-stressed fuels and soil.
- Additional resources, both ground and aviation, may be needed.
- Ensure firefighter pocket cards are up to date and posted on the national website (http://fam.nwcg.gov/fam-web/pocketcards/).
- Maintain national standardized predictive services products in a timely fashion. Produce new products as requested.

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